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(54) Abstract Title
Water soluble injection moulded container

(57) A water-soluble, injection-moulded container comprising a receptacle part and a sealing part which closes the receptacle part, which container encases a fabric care, surface care or dishwashing composition, wherein the receptacle part and the sealing part are integrally moulded and joined by a hinge part. The container may have two or more compartments and be made of PVA. The receptacle may be sealed to the sealing part by a snap-fit mechanism, adhesive or heat sealed.

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IMPROVEMENTS IN OR RELATING TO CONTAINERS

The present invention relates to a water-soluble, injection moulded container and to a process for preparing such a container.

It is known to package chemical compositions, particularly those which may be of a hazardous or irritant nature, in films, particularly water soluble films. Such containers can simply be added to water in order to dissolve or disperse the contents of the container into the water.

For example, WO 89/12587 discloses a package which comprises an envelope of a water soluble material which comprises a flexible wall and a water-soluble heat seal. The package may contain an organic liquid comprising, for example, a pesticide, fungicide, insecticide or herbicide.

WO 92/17382 discloses a package containing an agrochemical comprising a first sheet of non-planar water-soluble or water-dispersible material and a second sheet of water-soluble or water-dispersible material superposed on the first sheet and sealed to it.

The above methods of packaging have, however, a number of disadvantages.

The first disadvantage is that they do not have a particularly attractive appearance. In fields such as

containers used in the domestic environment, an attractive appearance for an article is extremely desirable. Liquids contained in envelopes of water-soluble film can have a limp, unattractive appearance.

The second disadvantage is that it is difficult to form two or more separate compartments in the packaging such that two or more incompatible components are both enclosed but separated from each other. Although an arrangement has been described to separate incompatible materials in flexible pouches in WO 93/08095, the method proposed is complex and is not currently achievable in large-scale manufacturing. It cannot, therefore, be used for producing large numbers of containers.

The third disadvantage is that there is only a limited control of the release profile of the compositions held in the containers. For example, when a composition is held between two planar water-soluble films or in a thermoformed package, the composition is simply released at the time when the films dissolve or disperse in water. While it may be possible to control to a certain extent the timing of the start of release of the contents, there can be no control over the rate of release of the contents since the entire film dissolves or disperses at about the same time. Furthermore it can be difficult to provide an extended time before the contents of the package are released. An additional problem also arises with thermoformed packages. If the thermoforming is not carefully controlled there may be inadvertent thinning of the film material at the points where the film material is drawn down into the mould when it is thermoformed.

This could result in release of the contents of the package early. Additionally, in all of the above packages, it is not possible to release different compositions at different times or different rates since, as discussed above, it is not possible to incorporate more than one composition in each water-soluble container.

The fourth disadvantage is that the containers cannot be produced at a particularly fast rate. When the containers are produced by heat-sealing planar films or by thermoforming, the containers have to be immediately filled and sealed. All of these procedures have to be carried out in succession. This means that it is not possible to obtain a quick throughput for mass-market goods such as household products. For example, standard thermoforming machines can only produce about 400 to 800 containers per minute, and vertical form fill sealing machines can only produce about 120 containers per minute.

It is also desirable to have a container which can be produced in a single process, since this avoids the use of multiple processing steps which may increase the cost and time taken to produce the final article, as well as reduce the throughput.

The present invention seeks to provide a water-soluble container which overcomes some or all of the above disadvantages.

The present invention provides a water-soluble, injection-moulded container comprising a receptacle part and a sealing part which closes the receptacle part, which container encases a fabric care, surface care or dishwashing composition, wherein the receptacle part and the sealing part are integrally moulded and joined by a hinge part.

The containers of the present invention overcome some or all of the above disadvantages.

Firstly, because the containers are generally rigid and self-supporting, they have an attractive, uniform appearance which does not vary between different containers. Furthermore, the containers can easily have various elements incorporated which are considered to be pleasing to the eye but which are impossible to incorporate in the flexible containers discussed above.

Secondly, because the containers are generally rigid, it is possible to introduce two or more compartments, or have larger compartments separated by walls, to separate mutually incompatible ingredients. The containers can also hold part of the composition on an external surface, for example in an indentation. Furthermore the container can be moulded in almost any shape that might be useful. In particular it can be given raised or lowered areas.

Thirdly, it is possible to control the release profile of the contents of the container. Since the container is generally rigid it is possible to adapt the thicknesses of some or all of the walls of the container to control

both the start of release of the composition as well as the rate of release. For example one or more walls of the receptacle part and/or the sealing part may be made thin in order to have an early release of the composition. Alternatively some or all of the walls of the receptacle part and/or the sealing part may be thick in order to ensure that there is a delayed release of the composition. The rate of release of the composition may also be controlled by ensuring that only part of the receptacle part and/or the sealing part of the container has thin walls which are dissolved or dispersed before the remainder of the container. Different walls or parts of walls of the receptacle part and/or the sealing part of the container may be prepared from different water-soluble polymers which have different dissolution characteristics. For example a first component may be fully enclosed by a polymer which dissolves at a higher or lower temperature than the polymer enclosing a second component. Thus different components can be released at different times. If the container holds a composition which does not flow, for example a solid or gelled composition, it is not even necessary for the container to fully enclose the composition. A part may be left exposed so that it immediately begins to dissolve when the container is added to water.

Fourthly, since the containers are generally rigid and self-supporting, they can be easily filled on a production line using normal filling equipment. Such equipment is easily capable of filling at least 1,500 containers per minute.

Fifthly, because the sealing part, or lid, is integrally formed with the receptacle part of the container, there is only one mould which is used. This simplifies the moulding process since the receptacle and sealing parts do not have to be separately formed. This also simplifies the filling process since steps do not need to be taken to provide a separate sealing part immediately after filling to ensure that the contents of the open container are not spilled. These advantages may also contribute to a reduction in cost of production due to the simplified production process. For example only one mould needs to be produced. Injection moulds can often cost up to £100,000 each. Furthermore less material can be used, resulting in a saving of material used and material wasted, as well as a saving of energy used and time taken to change moulds. Additionally savings can be made on storage space and logistics, because it is only necessary to track one component rather then two. Furthermore, since the receptacle part and sealing part are held in a certain spacial relationship, it is a simple matter to seal the receptacle part. Thus the filling and sealing processes are less likely to have the problems associated with the sealing part not properly registering with the receptacle part.

An additional advantage is that the sealing part is easily, accurately and consistently sited on onto the receptacle part.

Desirably the container, apart from its contents, consists essentially of, or consists of, the injection-moulded polymer composition. It is possible for suitable

additives such as plasticisers, lubricants and colouring agents to be added. Components which modify the properties of the polymer may also be added. Plasticisers are generally used in an amount of up to 20 wt%, for example from 15 to 20 wt%. Lubricants are generally used in an amount of 0.5 to 5 wt%. The polymer is therefore generally used in an amount of from 75 to 84.5 wt%, based on the total amount of the moulding composition. Suitable plasticisers are, for example, pentaerythritols such as depentaerythritol, sorbitol, mannitol, glycerine and glycols such as glycerol, ethylene glycol and polyethylene glycol. Solids such as talc, stearic acid, magnesium stearate, silicon dioxide, zinc stearate or colloidal silica may also be used.

It is also possible to include one or more particulate solids in the moulding composition in order to accelerate the rate of dissolution of the container. This solid may also be present in the contents of the container.

Dissolution of the solid in water is sufficient to cause an acceleration in the break-up of the container, particularly if a gas is generated, when the physical agitation caused may, for example, result in the virtually immediate release of the contents form the container.

Examples of such solids are alkali and alkaline earth metal, such as sodium, potassium, magnesium and calcium, bicarbonate and carbonate, in conjunction with an acid.

Suitable acids are, for example acidic substances having carboxylic or sulfonic acid groups or salts thereof. Examples are cinnamic, tartaric, mandelic, fumaric, maleic, malic, palmoic, citric and naphthalene disulfonic acids, as free acids or as their salts, for example with alkali or alkaline earth metals.

Any water-soluble polymer (which term is taken to include water-dispersible) may be used to form the compartments. Examples of water-soluble polymers are poly(vinyl alcohol) (PVOH), cellulose derivatives such as hydroxypropyl methyl cellulose (HPMC) and gelatin. An example of a preferred PVOH is ethoxylated PVOH. The PVOH may be partially or fully alcoholised or hydrolysed. For example it may be from 40 to 100%, preferably from 70 to 92%, more preferably about 88% or about 92%, alcoholised or hydrolysed. The degree of hydrolysis is known to influence the temperature at which the PVOH starts to dissolve in water. 88% hydrolysis corresponds to a film soluble in cold (ie room temperature) water, whereas 92% hydrolysis corresponds to a film soluble in warm water. A preferred PVOH which is already in a form suitable for injection moulding is sold in the form of granules under the name CP1210T05 by Soltec Developpement SA of Paris, France.

Thus by choosing an appropriate polymer it is possible to ensure that the container dissolves at a desired temperature. Thus it may be cold water (20°C) soluble, but may be insoluble in cold water and only become soluble in warm or hot water having a temperature of, for example, 30°C, 40°C, 50°C or even 60°C.

The walls of the receptacle part and/or the sealing part generally have a thickness such that the container is rigid. For example, the outside walls and any inside walls of the receptacle part and the sealing part may independently have a thickness of greater than 100μm, for example greater than 150μm or greater than 200μm, 300μm, 400μm, 500μm, 750μm or 1mm. Typically the receptacle part and the sealing part independently have a thickness of from 200μm to 1,500μm, preferably 300μm to 800μm. If different compartments having different dissolution times are required, different wall thicknesses for each compartment may be used. A thickness difference from 100μm to 500μm, preferably from 250μm to 350μm, would give a suitable difference in release times.

Preferably the sealing part dissolves in water before they receptacle part. It therefore generally has a wall thickness which is less than the wall thickness of the receptacle part. In general, the sealing part dissolves in water (at least to the extent of allowing the composition in the receptacle part to be partly or completely dissolved by the water) at 40°C in less than 5 minutes, preferably less than 2 minute.

The polymer may be injection moulded at any suitable temperature. A suitable moulding temperature, especially for PVOH, is from 180°C to 220°C, depending upon the formulation selected and the melt flow required.

The container may have any shape, but suitably is generally cuboid. The top wall may be formed by the sealing part and the side walls and base wall may be formed by the receptacle part. If the receptacle part or the sealing part contains two or more compartments, the dividing wall or walls preferably terminate at the top of each part, i.e. in the same plane as the top edges of the side walls, such that when the receptacle part is closed by the sealing part the contents of the compartments cannot mix.

Either or both of the receptacle part and the sealing part may be formed with an opening, for example a depression, formed in the side wall or in the base wall, and preferably being open in the outward direction. That is to say, it does not form part of the main volume defined by the container. Preferably the opening is adapted to receive, in a press-fit manner, a solid block, for example a tablet or ball, of a composition useful in a washing process. The opening may also receive a non-compressed composition, for example a gel, which is allowed to set in the opening. A composition held in such an opening may be released before the contents of the container are released.

The receptacle part and the sealing part are joined by a hinge part. All three parts are integrally moulded in the same injection mould. The hinge part is generally a planar portion which is sufficiently thin such that it is flexible. The hinge part may itself be a single part or have more than the one section, such as 2 or 3 sections, to provide better flexibility. Such an arrangement is

also known as an "active hinge". Generally the thickness of the hinge is from 100μm to 750μm, preferably from 200μm to 500μm.

The container may be provided with a single sealing part. It is also possible to provide the container with two or more sealing parts, of which at least one, and preferably all, are joined to the receptacle part by a hinge part. For example, if the receptacle part has two or more compartments, each compartment may be provided with a separate sealing part.

The hinge part may be attached to one or more outer faces of the receptacle part(s) and the sealing part(s) to one or more inner faces or to one or more edges thereof. In addition any external feature of the hinge present after sealing may optionally be removed by, for example, cutting. This may be carried out for aesthetic reasons.

Each container may be individually moulded. It is also possible to mould the containers a conjoined line or a two dimensional array. The containers are then filled with the desired composition. Before or after the filling step it is possible, if desired, to separate individual containers if more than one container has been moulded together. The containers are then sealed by folding the sealing part over the opening of the receptacle part. This may be done, for example, by the use of conveyor system, guide rails and rollers. It is especially useful to utilise a continuous motion process.

The sealing part may be attached to the receptacle part by any means. For example, a "snap-fit" arrangement may be used. Thus, for example, the receptacle part and the sealing part may have interlocking lugs or pins and holes. The two parts may also be sealed by means of an adhesive. A suitable adhesive is water or a solution of PVOH. The adhesive can be applied to the lids by spraying, transfer coating, roller coating or otherwise coating, or the lids can be passed through a mist of the adhesive. The lids can also be made tacky such that they adhere to each other without the need for a separate adhesive. Thus they can be heated, or kept at an elevated temperature such that they adhere to each other when they touch.

The parts may also be sealed by heat sealing or infra-red, radio frequency, ultrasonic, laser, solvent, vibration, electromagnetic, hot gas, hot plate, insert bonding or friction sealing or by spin welding. Preferably ultrasonic or laser sealing is used for a short cycle time. The seal desirably is water-soluble.

If heat sealing is used, a suitable sealing temperature is, for example, 120 to 195°C, for example 140 to 150°C. A suitable sealing pressure is, for example, from 250 to 600 kPa. Examples of sealing pressures are 276 to 552 kPa (40 to 80 p.s.i.), especially 345 to 483 kPa (50 to 70 p.s.i.) or 400 to 800 kPa (4 to 8 bar), especially 500 to 700 kPa (5 to 7 bar) depending on the heat sealing machine used. Suitable sealing dwell times are at least 0.4 seconds, especially 0.4 to 2.5 seconds.

It is possible for the sealing part and/or the receptacle part itself to have a composition incorporated therein or attached thereto. Thus, for example, the sealing part can be formed with a recess, on the inside or outside face, which is then filled and sealed, for example with a water-soluble film of, for example, PVOH. The sealing part can then be used to seal the receptacle part without the composition falling out of the sealing part.

If the containers of the present invention contain two or more compositions, they can have a particularly attractive appearance since the compositions, which may be identical or different, are held in a fixed position in relation to each other. The compositions can be easily differentiated to accentuate their difference. For example, the compositions can have a different physical appearance, or can be coloured differently. Furthermore the containers can be provided with a shape which may be difficult to produce by other methods. For example, by ensuring that the receptacle part and the sealing part each have a hemispherical shape, the final container can be in the form of a sphere.

After the container has been formed, the receptacle part is filled with the desired composition(s) which is intended to be released in an aqueous environment.

The composition(s) are independently be a fabric care, surface care or dishwashing composition. Thus, for example, they may be a dishwashing, water-softening, laundry or detergent composition, or a rinse aid. Such

compositions may be suitable for use in a domestic washing machine. The compositions may also independently be a disinfectant, antibacterial or antiseptic composition, or a refill composition for a trigger-type spray. Such compositions are generally packaged in total amounts of from 5 to 100 g, especially from 15 to 40 g. For example, a laundry composition may weigh from 15 to 40g, a dishwashing composition may weigh from 15 to 30 g and a water-softening composition may weigh from 15 to 40 g.

If the composition is an aqueous liquid having a relatively high water content, for example above 5 wt% water, it may be necessary to take steps to ensure that the liquid does not attack the water-soluble polymer if it is soluble in cold water, or water up to a temperature of, say, 35°C. Steps may be taken to treat the inside surfaces of the container, for example by coating it with agents such as PVdC (poly(vinylidene dichloride)) or PTFE (polytetrafluoroethylene), or to adapt the composition to ensure it does not dissolve the polymer. For example, it has been found that ensuring the composition has a high ionic strength or contains an agent which minimises water loss through the walls of the container will prevent the composition form dissolving the polymer from the inside. This is described in more detail in EP-A-518689 and WO 97/27743.

The compartment(s) may be completely filled or only partially filled. Each composition independently may be a solid. For example, it may be a particulate or granulated solid, or a tablet. Each composition may also

independently be a liquid, which may be thickened or gelled if desired. The liquid composition may be non-aqueous or aqueous, for example comprising less than or more than 5% or less than or more than 10wt% total or free water. Desirably the compositions contain less than 80 wt% water.

Each composition may have more than one phase. For example each composition may comprise an aqueous composition and a liquid composition which is immiscible with the aqueous composition. Each composition may also comprise a liquid composition and a separate solid composition, for example in the form of a ball, pill or speckles.

Thus the composition within the container, or an individual compartment, need not be uniform. For example, during manufacture the container or compartment could first be fed with a settable composition, for example, a gel, and then with a different composition. The first composition could dissolve slowly in the washing process so as to deliver its charge over a long period within the washing process. This might be useful, for example, to provide an immediate, delayed or sustained delivery of an component such as a softening agent.

If more than one composition is present, it is possible to ensure that the compositions are released at different times. Thus, for instance, one composition can be released immediately the container is added to water, whereas the other may be released later. This may be

achieved by having a compartment which takes longer to dissolve surrounding one or more of the compositions. This may be achieved by using different wall thicknesses for the compartments.

The compositions in each compartment may be the same or different. If they are different, they may, nevertheless, have one or more individual components in common.

The containers of the present invention may have any desired shape. For example, if the two halves of the container are identical, the container can have a regular geometrical shape such as a sphere, cube, cuboid, dodecahedron or cylinder. The cylinder may have any desired cross-section, such as a circular, triangular or square cross-section.

If the two halves of the container are not identical, the container can have a regular or irregular geometrical shape. For example it could have the form of a pyramid, with the sealing part forming the apex and the receptacle part forming the base. It could also have the form of an egg or distorted regular geometrical shape. While the completed container may have a regular geometrical shape, the individual parts may not necessarily be regular or identical. For example, if the final container has a cuboid shape, the individual parts may be in the form of compartments may have different sizes to accommodate different quantities of compositions.

The compartments may have the same or different size and/or shape. In general, if it is desired to have compartments containing different quantities of components, the compartments have volume ratios of from 2:1 to 20:1, especially from 4:1 to 10:1. The pairs of compartments may have the same lid size and shape for adhering to each other. Alternatively they may have a different size and/or a different shape. It is preferred that if the compartments have a different size, they have the same shape. In this case the lid of the smaller compartment is adhered to only part of the lid of the larger compartment. Two or more smaller compartments can, if desired, be adhered to the lid of the larger compartment.

The container may also have a hook portion so that it can be hung, for example, from an appropriate place inside a dishwashing machine.

The containers produced by the process of the present invention may, if desired, have a maximum dimension of 5 cm, excluding any flanges. For example, a container may have a length of 1 to 5 cm, especially 3.5 to 4.5 cm, a width of 1.5 to 3.5 cm, especially 2 to 3 cm, and a height of 1 to 2 cm, especially 1.25 to 1.75 cm.

If more than one composition is present, the compositions may be appropriately chosen depending on the desired use of the article.

If the article is for use in laundry washing, the primary composition may comprise, for example, a detergent, and

the secondary composition may comprise a bleach, stain remover, water-softener, enzyme or fabric conditioner. The article may be adapted to release the compositions at different times during the laundry wash. For example, a bleach or fabric conditioner is generally released at the end of a wash, and a water-softener is generally released at the start of a wash. An enzyme may be released at the start or the end of a wash.

If the article is for use as a fabric conditioner, the primary composition may comprise a fabric conditioner and the secondary component may comprise an enzyme which is released before or after the fabric conditioner in a rinse cycle.

If the article is for use in dish washing the primary composition may comprise a detergent and the secondary composition may comprise a water-softener, salt, enzyme, rinse aid, bleach or bleach activator. The article may be adapted to release the compositions at different times during the laundry wash. For example, a rinse aid, bleach or bleach activator is generally released at the end of a wash, and a water-softener, salt or enzyme is generally released at the start of a wash. The article may also have more than two compartments adapted to release compositions at different times. For example a three compartment container may contain a bleach, a bleach activator and an enzyme in different compartments. A four compartment container may also contain a salt in a fourth compartment.

Examples of surface care compositions are those used in the field of surface care, for example to clean, treat or

polish a surface. Suitable surfaces are, for example, household surfaces such as worktops, as well as surfaces of sanitary ware, such as sinks, basins and lavatories.

The ingredients of each composition depend on the use of the composition. Thus, for example, the composition may contain surface active agents such as an anionic, nonionic, cationic, amphoteric or zwitterionic surface active agents or mixtures thereof.

Examples of anionic surfactants are straight-chained or branched alkyl sulfates and alkyl polyalkoxylated sulfates, also known as alkyl ether sulfates. Such surfactants may be produced by the sulfation of higher C_8-C_{20} fatty alcohols.

Examples of primary alkyl sulfate surfactants are those of formula:

$$ROSO_3^-M^+$$

wherein R is a linear C_8-C_{20} hydrocarbyl group and M is a water-solubilising cation. Preferably R is C_{10}-C_{16} alkyl, for example C_{12}-C_{14}, and M is alkali metal such as lithium, sodium or potassium.

Examples of secondary alkyl sulfate surfactants are those which have the sulfate moiety on a "backbone" of the molecule, for example those of formula:

$$CH_2(CH_2)_n(CHOSO_3^-M^+)(CH_2)_mCH_3$$

wherein m and n are independently 2 or more, the sum of m+n typically being 6 to 20, for example 9 to 15, and M is a water-solubilising cation such as lithium, sodium or potassium.

Especially preferred secondary alkyl sulfates are the (2,3) alkyl sulfate surfactants of formulae:

$CH_2(CH_2)_x(CHOSO_3^-M^+)CH_3$ and

$CH_3(CH_2)_x(CHOSO_3^-M^+)CH_2CH_3$

for the 2-sulfate and 3-sulfate, respectively. In these formulae x is at least 4, for example 6 to 20, preferably 10 to 16. M is cation, such as an alkali metal, for example lithium, sodium or potassium.

Examples of alkoxylated alkyl sulfates are ethoxylated alkyl sulfates of the formula:

$RO(C_2H_4O)_nSO_3^-M^+$

wherein R is a C_8-C_{20} alkyl group, preferably C_{10}-C_{18} such as a C_{12}-C_{16}, n is at least 1, for example from 1 to 20, preferably 1 to 15, especially 1 to 6, and M is a salt-forming cation such as lithium, sodium, potassium, ammonium, alkylammonium or alkanolammonium. These compounds can provide especially desirable fabric cleaning performance benefits when used in combination with alkyl sulfates.

The alkyl sulfates and alkyl ether sulfates will generally be used in the form of mixtures comprising varying alkyl chain lengths and, if present, varying degrees of alkoxylation.

Other anionic surfactants which may be employed are salts of fatty acids, for example C_8-C_{18} fatty acids, especially the sodium or potassium salts, and alkyl, for example C_8-C_{18}, benzene sulfonates.

Examples of nonionic surfactants are fatty acid alkoxylates, such as fatty acid ethoxylates, especially those of formula:

$$R(C_2H_4O)_nOH$$

wherein R is a straight or branched C_8-C_{16} alkyl group, preferably a C_9-C_{15}, for example C_{10}-C_{14}, alkyl group and n is at least 1, for example from 1 to 16, preferably 2 to 12, more preferably 3 to 10.

The alkoxylated fatty alcohol nonionic surfactant will frequently have a hydrophilic-lipophilic balance (HLB) which ranges from 3 to 17, more preferably from 6 to 15, most preferably from 10 to 15.

Examples of fatty alcohol ethoxylates are those made from alcohols of 12 to 15 carbon atoms and which contain about 7 moles of ethylene oxide. Such materials are commercially marketed under the trademarks Neodol 25-7 and Neodol 23-6.5 by Shell Chemical Company. Other useful Neodols include Neodol 1-5, an ethoxylated fatty alcohol averaging 11 carbon atoms in its alkyl chain with about 5 moles of ethylene oxide; Neodol 23-9, an ethoxylated primary C_{12}-C_{13} alcohol having about 9 moles of ethylene oxide; and Neodol 91-10, an ethoxylated C_9-C_{11} primary alcohol having about 10 moles of ethylene oxide.

Alcohol ethoxylates of this type have also been marketed by Shell Chemical Company under the Dobanol trademark. Dobanol 91-5 is an ethoxylated C_9-C_{11} fatty alcohol with an average of 5 moles ethylene oxide and Dobanol 25-7 is an ethoxylated C_{12}-C_{15} fatty alcohol with an average of 7 moles of ethylene oxide per mole of fatty alcohol.

Other examples of suitable ethoxylated alcohol nonionic surfactants include Tergitol 15-S-7 and Tergitol 15-S-9, both of which are linear secondary alcohol ethoxylates available from Union Carbide Corporation. Tergitol 15-S-7 is a mixed ethoxylated product of a C_{11}-C_{15} linear secondary alkanol with 7 moles of ethylene oxide and Tergitol 15-S-9 is the same but with 9 moles of ethylene oxide.

Other suitable alcohol ethoxylated nonionic surfactants are Neodol 45-11, which is a similar ethylene oxide condensation products of a fatty alcohol having 14-15 carbon atoms and the number of ethylene oxide groups per mole being about 11. Such products are also available from Shell Chemical Company.

Further nonionic surfactants are, for example, C_{10}-C_{18} alkyl polyglycosides, such s C_{12}-C_{16} alkyl polyglycosides, especially the polyglucosides. These are especially useful when high foaming compositions are desired. Further surfactants are polyhydroxy fatty acid amides, such as C_{10}-C_{18} N-(3-methoxypropyl) glycamides and ethylene oxide-propylene oxide block polymers of the Pluronic type.

Examples of cationic surfactants are those of the quaternary ammonium type.

The total content of surfactants in the composition is desirably 0.1 to 95 wt%, especially 60 or 75 to 90 wt%. Desirably, in a laundry composition, an anionic surfactant is present in an amount of 50 to 75 wt%, the nonionic surfactant is present in an amount of 5 to 20 wt%, and/or the cationic surfactant is present in an amount of from 0 to 20 wt%. Desirably, in a dishwashing composition an anionic surfactant is present in an amount of 0.1 to 50 wt%, the non-ionic surfactant is present in an amount of 0.5 to 20 wt%, and/or the cationic surfactant is present in an amount of from 1 to 15 wt%. The amounts are based on the total solids content of the composition, i.e. excluding any solvent which may be present.

The composition, particularly when used as laundry washing or dishwashing composition, may also comprise enzymes, such as protease, lipase, amylase, cellulase and peroxidase enzymes. Such enzymes are commercially available and sold, for example, under the registered trade marks Esperesc, Alcalasc and Savinasc by Nova Industries A/S and Maxatasc by International Biosynthetics, Inc. Desirably the enzymes are present in the composition in an amount of from 0.5 to 3 wt%, especially 1 to 2 wt%.

The composition may, if desired, comprise a thickening agent or gelling agent. Suitable thickeners are polyacrylate polymers such as those sold under the trade

mark CARBOPOL, or the trade mark ACUSOL by Rohm and Hass Company. Other suitable thickeners are xanthan gums. The thickener, if present, is generally present in an amount of from 0.2 to 4 wt%, especially 0.5 to 2 wt%.

Dishwasher compositions usually comprise a detergency builder. Suitable builders are alkali metal or ammonium phosphates, polyphosphates, phosphonates, polyphosphonates, carbonates, bicarbonates, borates, polyhydroxysulfonates, polyacetates, carboxylates such as citrates, and polycarboxylates. The builder is desirably present in an amount of up to 90 wt%, preferably 15 to 90 wt%, more preferable 15 to 75 wt%, relative to the total weight of the composition. Further details of suitable components are given in, for example, EP-A-694,059, EP-A-518,720 and WO 99/06522.

The compositions can also optionally comprise one or more additional ingredients. These include conventional detergent composition components such as further surfactants, bleaches, bleach enhancing agents, builders, suds boosters or suds suppressors, anti-tarnish and anti-corrosion agents, organic solvents, co-solvents, phase stabilisers, emulsifying agents, preservatives, soil suspending agents, soil release agents, germicides, pH adjusting agents or buffers, non-builder alkalinity sources, chelating agents, clays such as smectite clays, enzyme stabilizers, anti-limescale agents, colourants, dyes, hydrotropes, dye transfer inhibiting agents, brighteners, and perfumes. If used, such optional ingredients will generally constitute no more than 10

wt%, for example from 1 to 6 wt%, the total weight of the compositions.

The builders counteract the effects of calcium, or other ion, water hardness encountered during laundering or bleaching use of the compositions herein. Examples of such materials are citrate, succinate, malonate, carboxymethyl succinate, carboxylate, polycarboxylate and polyacetyl carboxylate salts, for example with alkali metal or alkaline earth metal cations, or the corresponding free acids. Specific examples are sodium, potassium and lithium salts of oxydisuccinic acid, mellitic acid, benzene polycarboxylic acids, C_{10}-C_{22} fatty acids and citric acid. Other examples are organic phosphonate type sequestering agents such as those sold by Monsanto under the trade mark Dequest and alkylhydroxy phosphonates. Citrate salts and C_{12}-C_{18} fatty acid soaps are preferred.

Other suitable builders are polymers and copolymers known to have builder properties. For example, such materials include appropriate polyacrylic acid, polymaleic acid, and polyacrylic/polymaleic and copolymers and their salts, such as those sold by BASF under the trade mark Sokalan.

The builders generally constitute from 0 to 3 wt%, more preferably from 0.1 to 1 wt%, by weight of the compositions.

Compositions which comprise an enzyme may optionally contain materials which maintain the stability of the

enzyme. Such enzyme stabilizers include, for example, polyols such as propylene glycol, boric acid and borax. Combinations of these enzyme stabilizers may also be employed. If utilized, the enzyme stabilizers generally constitute from 0.1 to 1 wt% of the compositions.

The compositions may optionally comprise materials which serve as phase stabilizers and/or co-solvents. Example are C_1-C_3 alcohols such as methanol, ethanol and propanol. C_1-C_3 alkanolamines such as mono-, di- and triethanolamines can also be used, by themselves or in combination with the alcohols. The phase stabilizers and/or co-solvents can, for example, constitute 0 to 1 wt%, preferably 0.1 to 0.5 wt%, of the composition.

The compositions may optionally comprise components which adjust or maintain the pH of the compositions at optimum levels. The pH may be from, for example, 1 to 13, such as 8 to 11 depending on the nature of the composition. For example a dishwashing composition desirably has a pH of 8 to 11, a laundry composition desirable has a pH of 7 to 9, and a water-softening composition desirably has a pH of 7 to 9. Examples of pH adjusting agents are NaOH and citric acid.

The containers may themselves be packaged in outer containers if desired, for example non-water soluble containers which are removed before the water-soluble containers are used.

In use the container are simply added to water where the dissolve. Thus they may be added in the usual way to a

dishwasher or laundry machine, especially in the dishwashing compartment or a drum. They may also be added to a quantity of water, for example in a bucket or trigger-type spray.

CLAIMS

1. A water-soluble, injection-moulded container comprising a receptacle part and a sealing part which closes the receptacle part, which container encases a fabric care, surface care or dishwashing composition, wherein the receptacle part and the sealing part are integrally moulded and joined by a hinge part

2. A container according to claim 1 wherein the receptacle part has two or more compartments.

3. A container according to claim 2 wherein two or more compartments of the container are provided with separate sealing parts.

4. A container according to any one of the preceding claims wherein the receptacle part is sealed to the sealing part by a snap-fit mechanism.

5. A container according to any one of the preceding claims wherein the receptacle part is sealed to the sealing part by an adhesive.

6. A container according to any one of the preceding claims wherein the receptacle part is sealed to the sealing part by a heat-seal.

7. A container according to any one of the preceding claims which is made from poly(vinyl alcohol).

8. A container according to any one of the preceding claims which encases a dishwashing, water-softening, laundry, detergent or rinse aid composition.

9. A container according to any one of claims 1 to 7 which encases a disinfectant, antibacterial or antiseptic composition.

10. A container according to any one of the preceding claims which encases a refill composition for a trigger-type spray.

11. A container according to any one of the preceding claims wherein the sealing part dissolves before the receptacle part.

12. A process for preparing a container as defined in any one of the preceding claims which comprises integrally forming a receptacle part and a sealing part joined by a hinge part by injection moulding, filling the container with at least one fabric care, surface care or dishwashing composition, and sealing the receptacle part with the sealing part by operation of the hinge.

13. A process according to claim 12 which further comprises removing the hinge after the receptacle part has been closed by the sealing part.

14. An empty water-soluble, injection-moulded container comprising a receptacle part and a sealing part, wherein the receptacle part and the sealing part are integrally moulded and joined by a hinge part.

15. A process for preparing a container as defined in claim 14 which comprises integrally forming a receptacle part and a sealing part joined by a hinge part by injection moulding.

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Claims searched: 1-15

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): B8C (CWA1, CWA2, CWA3, CWS8)

Int Cl (Ed.7): B65D 65/46; C11D 17/04

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A, P	GB 2358382 A	(RECKITT) - see page 61, line 5- page 62, line 7.	
Y	US 5224601 A	(GOUGE) - see column 7, line 48- column 8, line 14	1, 2, 6-9, 11, 12, 14, 15
Y	FR 2724388 A	(NEGOCE) - see WPI abstract AN-1996-162081 [17].	1, 2, 6-9, 11, 12, 14, 15

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step. if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.